

Claims

We claim:

- 5 1. A gasket comprising
 at least two laminate tapes each comprising a plurality of porous
 expanded polytetrafluoroethylene (ePTFE) layers, the tapes comprising
 upper and lower laminate layers and side surfaces extending between
 upper and lower laminate layers, and
10 at least one substantially air impermeable layer
 wherein the at least two tapes are aligned along side surfaces and
 joined by the at least one substantially air impermeable layer extending
 the length of the tapes and positioned between two tape side surfaces.
- 15 2. The gasket of claim 1, wherein the upper and lower laminate layers
 define upper and lower gasket surfaces.
3. The gasket of claim 1, wherein the gasket is a form-in-place gasket.
4. The gasket of claim 1, wherein the gasket when uncompressed has a
 substantially uniform thickness across upper and lower gasket surfaces.
5. The gasket of claim 1 wherein the ePTFE has a density of less than 1.8
20 g/cc.
6. The gasket of claim 1, wherein the ePTFE has a density of less than 1.2
 g/cc.
7. The gasket of claim 1, wherein the ePTFE has a density of less than 1.0
 g/cc.
- 25 8. The gasket of claim 1, wherein at least a portion of the ePTFE layers is
 monoaxially expanded.
9. The gasket of claim 1, wherein at least a portion of the ePTFE layers is
 biaxially expanded.
10. The gasket of claim 1, wherein at least a portion of the ePTFE layers is
30 multiaxially expanded.
11. The gasket of claim 1, wherein at least one expanded
 polytetrafluoroethylene (ePTFE) layer comprises at least one filler.
12. The gasket of claim 11, wherein the at least one filler comprises at least
 one material selected from metals, semi-metals, metal oxides, glasses,
35 ceramics, activated carbons, carbon blacks, and polymeric resins.
- 13 13 The gasket of claim 11, wherein the at least one filler comprises at least
 one material selected from silica, barium sulfate, graphite, and glass
 beads.

- 14 The gasket of claim 1, wherein the at least one substantially air impermeable layer comprises a fluoropolymer.
- 15 The gasket of claim 1, wherein the at least one substantially air impermeable layer comprises a melt processable fluoropolymer.
- 5 16. The gasket of claim 1, wherein the at least one substantially air impermeable layer comprises tetrafluoroethylene/perfluoroalkyl vinyl ether copolymer (PFA).
17. The gasket of claim 1, wherein the at least one substantially air impermeable layer comprises tetrafluoroethylene/hexafluoropropylene copolymer (FEP).
- 10 18. The gasket of claim 1, wherein the at least one substantially air impermeable layer comprises polytetrafluoroethylene (PTFE), densified expanded polytetrafluoroethylene, or both.
- 19 The gasket of claim 1, wherein the at least one substantially air impermeable layer extends substantially completely between upper and lower laminate layers.
- 15 20. The gasket of claim 1, wherein the at least one substantially air impermeable layer extends beyond upper and lower laminate layers.
21. The gasket of claim 1, wherein the at least one substantially air impermeable layer has a permeability to air less than the expanded polytetrafluoroethylene (ePTFE).
- 20 22. The gasket of claim 1, wherein the tapes are joined along the side surfaces.
23. The gasket of claim 2, further comprising a reinforcing layer bridging the at least two tapes, bonded to at least one of the upper or lower gasket surface.
- 25 24. The gasket of claim 23, wherein reinforcing layer is bonded to at least one of the upper and lower gasket surfaces along the entire length of the tape.
- 30 25. The gasket of claim 1, wherein the substantially air impermeable layer is bonded along side surface joining the at least two tapes
26. The gasket of claim 2, wherein the gasket comprises an adhesive on at least one of the upper and lower gasket surfaces.
27. The gasket of claim 1, wherein the adhesive is a pressure sensitive adhesive.
- 35 28. A gasket comprising
at least two tapes comprising porous expanded polytetrafluoroethylene (ePTFE), the tapes comprising an upper and

- lower tape surfaces, and side surfaces extending between the upper and lower tape surfaces, and
- at least one substantially air impermeable layer,
- wherein the tapes are aligned along side surfaces and joined
- 5 along side surfaces by at least one substantially air impermeable layer extending there between and
- wherein the upper and lower tape surfaces and the plane of expansion of ePTFE are in the x-y plane of the tape.
- 29 The gasket of claim 28, wherein the ePTFE has a density of < 1.8 g/cc.
- 10 30. The gasket of claim 28, wherein the ePTFE has a density of < 1.0 g/cc.
31. The gasket of claim 28, wherein the gasket is a form-in-place gasket.
32. The gasket of claim 28, wherein the ePTFE is monoaxially expanded.
33. The gasket of claim 28, wherein the ePTFE is biaxially expanded.
34. The gasket of claim 28, wherein the ePTFE is multiaxially expanded.
- 15 35. The gasket of claim 28, wherein the gasket is uncompressed and has a substantially uniform thickness across the upper and lower gasket surfaces.
36. The gasket of claim 28, wherein the porous expanded polytetrafluoroethylene (ePTFE) comprises at least one filler.
- 20 37. The gasket of claim 36, wherein the at least one filler comprises at least one material selected from metals, semi-metals, metal oxides, glasses, ceramics, activated carbons, carbon blacks, and polymeric resins.
38. The gasket of claim 36, wherein the at least one filler comprises at least one of silica, barium sulfate, graphite, and glass beads.
- 25 39. The gasket of claim 28, wherein the at least one substantially air impermeable layer comprises a fluoropolymer.
40. The gasket of claim 28, wherein the at least one substantially air impermeable layer comprises a melt processable fluoropolymer.
41. The gasket of claim 28, wherein the at least one substantially air
- 30 impermeable layer comprises tetrafluoroethylene/perfluoroalkyl vinyl ether copolymer (PFA).
42. The gasket of claim 28, wherein the at least one substantially air impermeable layer comprises tetrafluoroethylene/hexafluoropropylene copolymer (FEP).
- 35 43. The gasket of claim 28, wherein the at least one substantially air impermeable layer comprises at least one of PFA or FEP in combination with ePTFE.

44. The gasket of claim 28, wherein the at least one substantially air impermeable layer comprises polytetrafluoroethylene (PTFE), densified expanded polytetrafluoroethylene, or both.
45. The gasket of claim 28, wherein at least one substantially air impermeable layer extends substantially completely between upper and lower tape surfaces.
46. The gasket of claim 28, wherein the at least one substantially air impermeable layer extends beyond upper and lower tape surfaces.
47. The gasket of claim 28, wherein the at least one substantially air impermeable layer has a permeability to air less than the permeability of the porous expanded polytetrafluoroethylene (ePTFE).
48. The gasket of claim 28, further comprising a reinforcing layer bridging the at least two tapes, bonded to at least one of the upper and lower tape surfaces.
49. The gasket of claim 48, wherein reinforcing layer is bonded to at least one of the upper and lower tape surfaces along the entire length of the tapes.
50. The gasket of claim 49, wherein reinforcing layer is expanded PTFE.
51. The gasket of claim 28, wherein the gasket comprises an adhesive on at least one of the upper and lower gasket surfaces.
52. The gasket of claim 51, wherein the adhesive is a pressure sensitive adhesive.
53. A gasket comprising at least two tapes each comprising a plurality of porous expanded polytetrafluoroethylene (ePTFE) layers, the tapes comprising upper and lower porous ePTFE layers, and side surfaces extending between upper and lower ePTFE layers and at least one fluoropolymer material wherein the at least two tapes are bonded along the tape side surfaces by at least one fluoropolymer material extending substantially the entire length of the tapes and positioned between two tape side surfaces, wherein the upper and lower porous ePTFE layers define upper and lower gasket surfaces, and wherein the gasket is a form-in-place gasket.
54. The gasket of claim 53, wherein the at least two tapes consist essentially of a plurality of porous ePTFE layers.
55. The gasket of claim 53, wherein porous ePTFE has a density of less than 1.8 g/cc.

56. The gasket of claim 53, wherein the porous ePTFE layers comprise at least one filler material selected from metals, semi-metals, metal oxides, glasses, ceramics, activated carbons, carbon blacks, and polymeric resins.
- 5 57. The gasket of claim 53, wherein at least a portion of the ePTFE layers is monoaxially expanded.
58. The gasket of claim 53, wherein at least a portion of the ePTFE layers is biaxially expanded.
59. The gasket of claim 53, wherein at least a portion of the ePTFE layers is multiaxially expanded.
- 10 60. The gasket of claim 53, wherein the gasket is uncompressed and has a substantially uniform thickness across the upper and lower gasket surfaces.
61. The gasket of claim 53, wherein the at least one fluoropolymer comprises a melt processable fluoropolymer.
- 15 62. The gasket of claim 53, wherein the at least one fluoropolymer material comprises tetrafluoroethylene/perfluoroalkyl vinyl ether copolymer (PFA).
63. The gasket of claim 53, wherein the at least one fluoropolymer material comprises tetrafluoroethylene/hexafluoropropylene copolymer (FEP).
- 20 64. The gasket of claim 53, wherein the at least one fluoropolymer material comprises polytetrafluoroethylene (PTFE), densified expanded PTFE, or both.
65. The gasket of claim 53, wherein at least one fluoropolymer material extends substantially completely between upper and lower ePTFE layers.
- 25 66. The gasket of claim 53, wherein at least one fluoropolymer material extends beyond upper and lower ePTFE layers.
67. The gasket of claim 53, wherein the at least one fluoropolymer material has a permeability to air that is less than the expanded polytetrafluoroethylene (ePTFE))
- 30 68. The gasket of claim 53, further comprising a reinforcing layer bridging the at least two tapes.
69. The gasket of claim 68, wherein reinforcing layer is bonded to at least one of the upper and lower ePTFE layers.
- 35 70. The gasket of claim 68, wherein reinforcing layer is bonded to at least one of the upper and lower tape surfaces along the entire length of the tape.

71. The gasket of claim 53, wherein the gasket comprises an adhesive on at least one of the upper and lower gasket surfaces.
72. The gasket of claim 53, wherein the adhesive is a pressure sensitive adhesive.
- 5 73. A method of forming a composite tape comprising the steps of:
- a. providing at least two porous expanded PTFE tapes each having upper and lower tape surfaces, and side surfaces extending between upper and lower tape surfaces
 - b. aligning at least two ePTFE tapes along side surfaces,
 - 10 c. providing at least one material capable of forming at least one substantially air impermeable layer between aligned side surfaces of the at least two ePTFE tapes, and
 - d. joining the at least two ePTFE tapes to form a composite tape comprising at least two joined ePTFE tapes having at least one
 - 15 substantially air impermeable material extending between the upper and lower surfaces of the at least two tapes along the length of the composite,
- wherein the upper and lower tape surfaces and the plane of expansion of the ePTFE are in the x-y direction of the tape.
- 20 74. The method of claim 73, comprising bonding at least one substantially air impermeable material to at least one of the tape side surfaces along the entire tape length prior to joining at least two ePTFE tapes.
75. The method of claim 73, further comprising bonding at least one side surface of at least two ePTFE tapes along the entire tape length with the
- 25 material prior to joining at least two ePTFE tapes.
76. The method of claim 73, comprising joining at least two tapes having at least one bonded tape side surface to form a composite tape.
77. The method of claim 73, further comprising coating at least one side surface of at least one ePTFE tape along the entire length with the
- 30 material capable of forming at least one substantially air impermeable layer prior to joining at least two ePTFE tapes.
78. The method of claim 73, wherein the step of joining comprises applying heat and pressure at a juncture of the side surfaces of the tapes to weld the at least one material and the at least two expanded PTFE tapes to
- 35 form a substantially air impermeable layer between the aligned ePTFE side surfaces.
79. The method of claim 73 wherein the density of the ePFE tape does not increase more than 30% after joining the at least two ePTFE tapes.

80. The method of claim 73 wherein the density of the ePFE tape does not increase more than 20% after joining the at least two ePTFE tapes.
81. The method of claim 73 wherein the density of the ePFE tape does not increase more than 10% after joining the at least two ePTFE tapes.
- 5 82. The method of claim 73, further comprising joining two ends of the composite tape to form a gasket.
83. The method of claim 82, wherein upper and lower tape surfaces correspond to upper and lower gasket surfaces.
84. The method of claim 73, wherein the gasket is uncompressed and has a substantially uniform thickness across the upper and lower gasket surfaces.
- 10 85. The method of claim 73, wherein the at least one material capable of forming at least one substantially air impermeable comprising a fluoropolymer.
- 15 86. The method of claim 85, wherein the fluoropolymer is a melt processable fluoropolymer.
87. The method of claim 86, wherein the fluoropolymer comprises tetrafluoroethylene/ perfluoroalkyl vinyl ether copolymer (PFA).
88. The method of claim 86, wherein the fluoropolymer comprises tetrafluoroethylene/ hexafluoropropylene copolymer (FEP).
- 20 89. The method of claim 86, wherein the fluoropolymer comprises polytetrafluoro ethylene (PTFE).
90. The method of claim 86, wherein the fluoropolymer comprises densified expanded polytetrafluoroethylene.
- 25 91. The method of claim 73, wherein the at least one material capable of forming a substantially air impermeable material extends substantially completely between upper and lower tape surfaces.
92. The method of claim 73, wherein the at least one material capable of forming a substantially air impermeable layer has a permeability to air less than the expanded polytetrafluoroethylene (ePTFE)).
- 30 93. The method of claim 73, further comprising the step of bonding a reinforcing layer to at least one of the upper and lower tape surfaces bridging the adjoining side surfaces.
94. The method of claim 73, further comprising the step of bonding a reinforcing layer to upper and lower tape surfaces bridging the at least two tapes along the entire length of the tape.
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95. The method of claim 73, wherein the step of joining at least two tapes comprises bonding a reinforcing layer to upper and lower tape surfaces along the entire length of the tape.
96. A method of forming a composite tape comprising the steps of:
- 5 a. providing at least two porous expanded polytetrafluoroethylene (ePTFE) tapes, the tapes having upper and lower surfaces, and side surfaces extending between upper and lower surfaces, the upper and lower tape surfaces and the plane of expansion of the ePTFE both in the x-y plane of the tape,
- 10 b. providing at least one material capable of forming a substantially air impermeable layer,
- c. bonding the at least one material on at least one side surface of each of the at least two ePTFE tapes to form a substantially air impermeable layer comprising the steps of
- 15 contacting and applying pressure and heat to the ePTFE tape and the at least one material above the melt temperature of the ePTFE and the at least one material, to weld the material and the ePTFE together forming a substantially air impermeable layer on the tape side surface, and
- 20 d. joining at least two ePTFE tapes along side surfaces comprising the steps of
1. applying heat at a juncture of at least two ePTFE tape side surfaces having the substantially air impermeable layer bonded thereto, above the melt temperature of the substantially air impermeable layer,
- 25 2. contacting and applying pressure to the at least two heated ePTFE tapes to weld the substantially air impermeable layers of the at least two ePTFE tapes joining the tapes to form a tape composite.
97. The method of claim 96, wherein the steps of contacting, applying heat and pressure to form a substantially air impermeable layer on at least one ePTFE tape side surface are continuous.
- 30 98. The method of claim 96 wherein the steps of applying heat, contacting and applying pressure to join at least two ePTFE tapes along side surfaces are continuous.
- 35 99. The method of claim 96, wherein the steps of forming a substantially air impermeable layer on at least one ePTFE side surface and the steps of joining at least two ePTFE tapes along side surfaces are continuous.

100. The method of claim 96, wherein the ePTFE tapes comprise a plurality of ePTFE layers.
101. The method of claim 100, wherein the ePTFE tapes comprise upper and lower porous ePTFE layers and side surfaces extending between the upper and lower ePTFE layers.
102. The method of claim 100, wherein the ePTFE tapes consist essentially of a plurality of porous ePTFE layers.
103. The method of claim 100, wherein at least a portion of the porous ePTFE layers comprise a filler.
104. The method of claim 96, wherein the ePTFE tapes comprise a filler
105. The method of claim 96, wherein the at least one material capable of forming a substantially air impermeable material comprises at least one fluoropolymer.
106. A method of forming a composite tape comprising the steps of:
- a. providing at least two laminate porous expanded polytetrafluoroethylene (ePTFE) tapes having a plurality of ePTFE layers, the tapes having upper and lower laminate layers, and side surfaces extending between upper and lower laminate layers, the upper and lower laminate layers and the plane of expansion of the ePTFE parallel with the x-y plane of the tape
 - b. providing at least one material capable of forming a substantially air impermeable layer comprising at least one of FEP and PFA
 - c. bonding the at least one material on at least one side surface of the at least two ePTFE tapes to form a substantially air impermeable layer comprising the steps of
 - contacting and applying pressure and heat to the ePTFE tapes and the at least one material above the melt temperature of the ePTFE and the at least one material to weld the material and the ePTFE together forming a substantially air impermeable layer on the at least one tape side surface, and
 - d. joining at least two ePTFE tapes along side surfaces comprising the steps of
 - 1. applying heat at a juncture of at least two ePTFE tape side surfaces
- having the substantially air impermeable layer bonded thereto, above the melt temperature of the substantially air impermeable layer,

2. contacting and applying pressure to the at least two heated ePTFE tapes to weld the substantially air impermeable layers of the at least two ePTFE tapes joining the tapes to form a tape composite.